ARGUMENT

Regarding the Claims in General:

Claims 2-13 and 24-26 are now pending. Claim 1 has been rewritten as new claim 24 to better highlight features distinguishing the present invention over the prior art. Non-elected claims 14-23 were previously canceled without prejudice to presentation in a divisional application. Claims 2-13 have been amended as necessary to depend on new claim 24, but otherwise remain as previously presented. Claims 25 and 26 have been added to provide applicants with additional protection to which they appear to be entitled in view of the prior art.

No new matter has been introduced in claims 24-26.

Regarding the Prior Art Rejections:

Claims 1, 2, 12, and 13 stand rejected as being anticipated by Namerikawa U.S. Patent 6,523,423 (Namerikawa '423), and claims 1-4, 12 and 13 stand rejected as being anticipated by Namerikawa U.S. Patent 6,347,555 (Namerikawa '555). In addition, claims 1-5 and 8-13 stand rejected as being unpatentable over Sato U.S. Patent 5,985,064 (Sato) in view of either Namerikawa '423 or Namerikawa '555, and claims 1-7 and 12-13 stand rejected as being unpatentable over Mizutani Japanese Published Application JP 2000-369072 (Mizutani) in view of either Namerikawa '423 or Namerikawa '555. Applicants respectfully request reconsideration and withdrawal of these rejections in view of the replacement of claim 1 by new claim 24, and the comments below.

Preliminarily, as understood by applicants, the Examiner's basic position is that the claims as previously presented were not rendered patentable by the included functional recitations and statements of intended use because he considered the cited prior art (mainly the two Namerikawa patents, and perhaps Sato and Mizutani) as being capable of performing the recited functions and intended use (see Section 10, second paragraph of the Office Action). Specifically, the Examiner appears to believe that the force sensors of these references could be used to align a bonding tool.

Regrettably, the Examiner has not provided any explanation for his conclusion that the claimed functionality and utility for alignment of a bonding tool are inherent in the cited references. In fact, the Examiner's unsupported assertion of inherency is entirely contrary to the requirements

set forth by the Board of Patent Appeals and Interferences 20 years ago in *Ex parte Skinner,* 2 U.S.P.Q. 2d 1788 (BdPatApps&Int 1986).

In *Skinner,* the Examiner stated in a final rejection, that although the applied reference "does not explicitly disclose the properties claimed by appellant, such properties *may be* inherent characteristics of the reference . . ."

The Board reversed, holding:

> Inherency, however, may not be established by probabilities or possibilities. . . before an appellant can be put this burdensome task [of disproving inherency], the examiner must provide some evidence or scientific reasoning to establish the reasonableness of the examiner' s belief that the functional limitation is an inherent characteristic of the prior art. *Ex parte Skinner, supra,* at 1789.

It is respectfully submitted that the Examiner has provided no evidence or scientific reasoning in the outstanding Office Action to establish the reasonableness of his belief that cited prior art apparatus are capable of being used to align a bonding tool, or of functioning in the manner recited in claim 1 as previously presented.

Despite the Examiner's failure to comply with applicable legal precedent, in an effort to advance the prosecution, claim 1 has been rewritten as new claim 24, and arguments are presented below to demonstrate in general terms why the Examiner's beliefs as to the inherent capabilities of the prior art apparatus are not correct. Nevertheless, this does not relieve the Examiner of his responsibility to demonstrate inherency in the first instance. If the previous rejections are maintained with respect to new claim 24, the Examiner is respectfully requested to provide the evidence or scientific reasoning required by *Ex parte Skinner, supra.*

Specifically, it is respectfully submitted that for any of the reference apparatus to be used to accurately align a device such as a bonding tool, *substantial modification* would be required. There is no teaching or motivation in the prior art for such modification. Except for the teachings of the present invention, there is nothing which would motivate one skilled in the art to make the necessary modifications.

As explained in the Specification, bonding tools for semiconductor device assembly must be precisely aligned such that there is less than 16 microns difference between the highest and lowest points on the surface of a chip or die carried by the bonding tool when the die is brought into the

bonding position relative to a bonding surface. Accurate measurement of the orientation of the bonding tool is therefore essential. According to the invention, this is achieved by providing a force sensor comprised of multiple isolated sensing sections, each responsive only to force applied to that sensing section due to contact with the bonding tool.

In other words, if the bonding tool is aligned perpendicular to the sensing surfaces of the force sensing sections, those sensing sections in contact with the bonding tool will all experience substantially equal forces (subject perhaps to some variation at the margin of the bonding tool). If, however, the bonding tool is not properly aligned, there will be differences in the forces experienced by the different sensing sections. These differences are sensed, and used to generate an alignment signal according to the present invention.

This construction is clearly reflected in claim 24, directed to an apparatus for aligning a bonding tool, and comprising:

> a force sensor configured to measure a force generated by the bonding tool on the force sensor,
>
> wherein the force sensor comprises a plurality of force sensing sections, the force sensing sections being isolated from each other and configured such that each force section is respectively responsive only to compressive forces applied to it by a portion of the bonding tool in contact with that force sensing section, and substantially non-responsive to forces applied to the force sensor from parts of the bonding tool not in contact with that force sensing section,
>
> the apparatus being responsive to differences between the individually detected forces to generate an alignment signal representing departure of the orientation of the bonding tool from the desired alignment.

Although the Namerikawa patents do disclose multiple force sensing sections, these are not isolated from each other. In Namerikawa '423, force sensing sections 6 are mounted on a flexible plate 5a which has operating member 2 suspended from it (see Figs. 1a-1c). Forces applied to the operating member 2 cause plate 5a to flex, and the forces are thereby transmitted to all the sensing sections 6. Namerikawa '555 is similar; sensors 14x-17x, 14y-17y, 14z-17z are mounted on a flexible plate 12 carried by a supporting base 11 with an operating member 10 also mounted on plate 12, and suspended between the portions of base 11 (see Figs. 2a, 2b).

Obviously, there is no disclosure, teaching, or suggestion to use these constructions for alignment of a bonding tool. Moreover, the Examiner is obligated by *Ex parte Skinner, supra* to provide evidence or scientific reasoning to demonstrate that can even be used for this purpose. It is not enough for him just to state the unsupported conclusion that he "considers" them capable of doing so.

Even accepting for purposes of discussion that the Namerikawa sensors could be used for alignment of a bonding tool if one wished to do so, that would not satisfy the terms of claim 24 which calls for the individual force sensing sections to be isolated from each other such that each is responsive to force applied to it due to direct contact with a portion of the bonding tool, i.e.,

> . . . isolated from each other and configured such that each force section is respectively responsive only to compressive forces applied to it by a portion of the bonding tool in contact with that force sensing section, and substantially non-responsive to forces applied to the force sensor from parts of the bonding tool not in contact with that force sensing section . . .

For one thing, in the Namerikawa sensors, the sensing elements are not isolated from each other. In both patents, a force acting on the operating member is transmitted by flexion of the sensor mounting plate to all of the sensing elements. In fact, the operating member must be positioned so that force acting on it is transmitted to all the sensing elements. If, for example, the operating member were positioned on one of the sensing elements, the support plate could not flex in that area, and no force would be transmitted to that sensing section.

Moreover, because of the flexion of the support plates, the individual sensing sections in the Namerikawa devices are not configured to be responsive only to compressive forces, but are responsive at least to tensile forces as well.

From the discussion above, it should likewise be apparent that the Namerikawa force sensing sections are not *configured* to be responsive only to directly acting forces. The Namerikawa force sensing sections are elongated ring segments, while according to the present invention, each sensing element, is comprised of bundles of ceramic fibers, one end of which engages with a portion of the bonding tool during operation. The sensing area of each bundle is substantially smaller than the total contact area of the bonding tool. This effectively improves the resolution of the sensor, and contributes to accurate alignment.

Neither Sato nor Mizutani remedies the basic deficiency in the Namerikawa patents. Sato is concerned only with controlling the downward movement of the bonding tool to apply a desired bonding force between a chip or die to be bonded and the bonding surface (see col. 1, lines 43-49). It is accordingly responsive to force in a single direction, a scalar rather than a vector force. Sato is not concerned with alignment of a bonding tool, or any other device.

In any case, from the description at column 3, line 65 through column 4, line 30, it is apparent that there is no disclosure, teaching or suggestion in Sata of a sensor having multiple sensing sections isolated from each other, etc. Therefore, combining the teachings of Sato and the Namerikawa patents would not yield sensor elements that are isolated from each other such that each element detects only the force acting directly on it, as required by claim 24.

Mizutani has nothing to do with bonding tool alignment at all. Although it is quite difficult to understand the English translation, it is clear from Figs. 5-7 that the problem with the die is not that it is misaligned, but that the sides are not completely vertical, so that when held by the chip holder, its bottom face is not perfectly parallel with the die attachment surface 22a (see also last part of Abstract relating to perpendicularity). The solution is to determine when a corner of the bottom face contacts the die attachment surface 22a, so as to calculate the descrease in the descent of the chip holder by substracting the gap height (G) from the calibration height (C), in order not to damage the die attachment surface (see paragraph [0016] and [0026-0027]). Alignment does not come into the picture at all, simply because the orientation of the chip holder 27 is not changed and the chip holder 27 remains perfectly vertical. Thus, the die is still attached in the "misaligned" orientation, albeit at an adjusted attachment height. Furthermore, the load sensor 25 is located only at one corner of the stage 23. Even if it had a plurality of force sensing sections, it cannot detect an alignment of the die because it detects only a corner of stage 23 that is moved by the die, and not different parts of the die itself. For argument sake, even if sides of the die were perfectly perpendicular and the bottom face is perfectly parallel with the die attachment surface 22a, the load sensor 25 would still sense a force once the bottom face touches the die attachment surface 22a.

Claims 2-13 and 25-26 are directly or indirectly dependent on allowable claim 24, and are therefore also allowable for the reasons stated above. In addition, these claim recite features which,

in combination with the features of their respective parent claims are neither taught nor suggested in the prior art, whether considered singly or in combination.

Conclusion:

In view of the foregoing, favorable reconsideration and allowance of this application are respectfully solicited.

Respectfully submitted,

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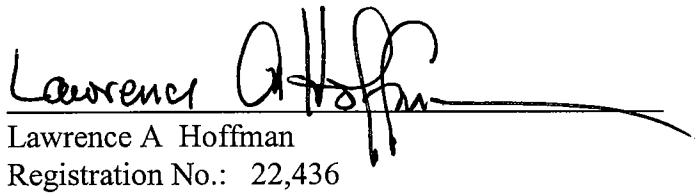

Lawrence A Hoffman
Registration No.: 22,436
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700